

- 14 -

CLAIMS

1. Teleoperated endoscopic capsule for diagnostic and therapeutic purposes inside a human body cavity, characterised in that it comprises a body (1) with a plurality of locomotion modules (5) placed on its surface, suitable for moving said body in said cavity, a source of energy inside said body, a microcontroller (ȳP) in said body (1) to actuate said locomotion modules (5) on the basis of commands teletransmitted by an operator, a video camera for capturing images, controlled by said microcontroller (ȳP), a transceiver system for receiving commands teletransmitted by the operator and for transmitting the images captured via said video camera.

2. Endoscopic capsule according to claim 1, wherein each of said locomotion modules (5) comprises a leg (6) suitable for being brought into contact with the wall of said cavity for transmitting the locomotion force and moving the points of contact with it to produce locomotion, said leg having at least two degrees of freedom, and means (7) for actuating the movements of said leg controlled by said microcontroller (ȳP).

3. Endoscopic capsule according to claims 1 or 2, wherein said body (1) has a front end and a rear end spaced longitudinally and said leg (6) has at least one degree of freedom active in the longitudinal direction of said body (1) controlled by said actuator means (7).

4. Endoscopic capsule according to claim 3, wherein said leg (6) has at least one passive degree of freedom to adapt the force of contact against said wall to the deformability of the same wall.

5. Endoscopic capsule according to any one of the previous claims, wherein said leg (6) is a substantially

- 15 -

rod-shaped element in two portions (6a, 6b), end-to-end connected by a knee portion (6c) with increased flexibility, and comprises grasping means (18, 19) for increasing adherence of the contact against said wall.

5 6. Endoscopic capsule according to any one of claims 1 to 4, wherein said leg (6) is a substantially rod-shaped element with a plurality of sections (6c) with increased flexibility along it, and comprises grasping means (18, 19) to increase adherence of the contact with the wall.

10 7. Endoscopic capsule according to claims 5 or 6, wherein said grasping means comprise a plurality of microhooks (19) aligned along an enlarged end (18) of said leg (6), said microhooks being turned towards said rear end of said body (1).

15 8. Endoscopic capsule according to claim 7, wherein said microhooks (19) also extend along one edge of said leg.

9. Endoscopic capsule according to any one of the previous claims, wherein said knee portions (6c) with increased flexibility are made by material removal.

20 10. Endoscopic capsule according to any one of the previous claims, wherein said knee portions (6c) with increased flexibility comprise end-of-stroke stops (25, 26) to limit the angular movement in both directions.

11. Endoscopic capsule according to any one of the previous claims, wherein said legs (6) are made in shape memory alloy (SMA).

25 12. Endoscopic capsule according to any one of the previous claims, wherein said actuator means (7) comprise a pair of wires (20, 21) in shape memory alloy (SMA)
30 connected to said leg (6) and acting in opposition to move it angularly around an axis perpendicular to the longitudinal direction of said body (1), said wires (20,

- 16 -

21) being selectively fed with an electrical current under the control of said microcontroller (μ P).

13. Endoscopic capsule according to any one of the previous claims, wherein each locomotion module (5) comprises a support (8) housed longitudinally on said body (1), at one end of said support (8) a pulley (11) being provided, with axis perpendicular to the longitudinal direction of said body, said leg (6) extending radially from said pulley (11), said SMA wires (20, 21) being connected to said pulley (11) at diametrically opposite parts thereof and to electrical contacts (22) provided at the opposite end of said support (8).

14. Endoscopic capsule according to any one of the previous claims, wherein said locomotion modules (5) are placed one alongside the other on said body in such a way that the corresponding legs (6) are alternatively on the side of the front end and of the rear one of said body (1).

15. Endoscopic capsule according to any one of the previous claims, wherein said locomotion modules (5) are at least six.

16. Endoscopic capsule according to any one of the previous claims, wherein said actuator means (7) are suitable for transmitting angular movements of said leg between a rest position, wherein it is placed longitudinally along said body, and a position of maximum radial extension.

17. Endoscopic capsule according to claim 16, wherein in said rest position said leg (16) is housed in said support (8).

- 17 -

18. Endoscopic capsule according to claim 16, wherein the position of maximum radial extension of said leg is at 120° in relation to said rest position.

19. Endoscopic capsule according to any one of the
5 previous claims, wherein a biodegradable coating is provided on said body for containing the legs during the swallowing process.

20. System for diagnostic and therapeutic endoscopy inside a human body cavity, characterised in that it
10 comprises an endoscopic capsule according to any one of the previous claims and an external control interface for transmitting to said capsule the commands for its locomotion in said cavity and for the reception and processing of the obtained data.

15

20

25

30